

Calibration of 3D Woven Preform Design Code for CMC Materials, Phase I

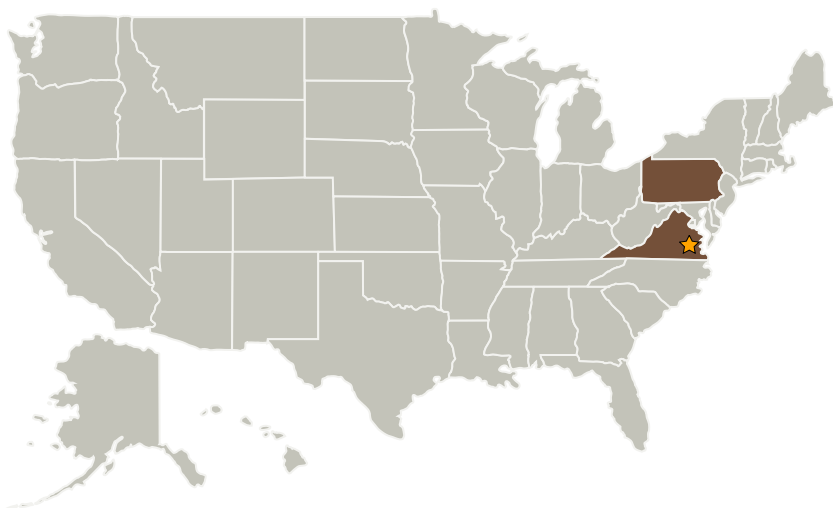
Completed Technology Project (2009 - 2009)



Project Introduction

Future hypersonic vehicles will utilize thermal protection system (TPS) designs and propulsion system components that are capable of experiencing high temperatures within oxidative environments during their operation. These TPS and propulsion system components will include high temperature ceramic matrix composites (CMCs), such as C/SiC and SiC/SiC. Both hot structure control surfaces and hot wall propulsion system components are two examples of CMCs for which prototype parts have thus far been fabricated and subjected to mechanical performance and/or durability testing. Mechanical and thermal performance of these CMC components will benefit from low part count, integrally fabricated designs. In integrally fabricated designs, the reinforcement preforms have included 3D woven construction. The advantages of these designs include the elimination of the need for post-fabrication mechanical attachment as well as the higher interlaminar properties offered by the through thickness paths of the fibers within the 3D preform architectures. The specific innovations MR&D is proposing in this Phase I SBIR program are the following: 1)Extend the capabilities of an existing MR&D 3D preform design code to include material property calculations; 2)Automatically link the MR&D 3D preform design code to provide 3D solid model images of the 3D preform designs using the TexGen imaging freeware code, and 3)Calibrate the completed code specifically for 3D CMC materials through fabrication, imaging and mechanical property measurements.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Materials Research and Design, Inc.	Supporting Organization	Industry	Wayne, Pennsylvania

Primary U.S. Work Locations

Pennsylvania	Virginia
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.3 Thermal Protection Components and Systems
 - └ TX14.3.1 Thermal Protection Materials